REPORT DOCUMENTATION PAGE

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6. AUTHOR(S) Shridhar Yarlagadda, Bazle Haque		**5d. PROJECT NUMBER**
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13. SUPPLEMENTARY NOTES

14. ABSTRACT

2D AutoDyn analyses of cylinder impact on ceramic plate have been conducted to identify the mesh size needed to capture detail crack growth in ceramic tiles
Steel 4340 is used for the projectile and AutoDyn SiC material properties are used for the ceramic tile
Mesh sensitivity analysis is performed using four different square mesh sizes:
- 0.50-mm x 0.50-mm square mesh
- 0.40-mm x 0.40-mm square mesh
- 0.30-mm x 0.30-mm square mesh
- 0.20-mm x 0.20-mm square mesh

Results shows that 0.20-mm mesh size provides a fracture pattern that may be considered acceptable for analysis
A conico-cylinder projectile is also used to study the fracture behavior with 0.20-mm mesh size
We will develop 3D FEMs for further AutoDyn analyses
An undergraduate student is working in the Summer 2013 session, and we are planning to recruit a graduate student in the Fall

15. SUBJECT TERMS

2D AutoDyn modeling, cylinder impact, conico-cylinder impact, fracture pattern, mesh sensitivity

16. SECURITY CLASSIFICATION OF:			**17. LIMITATION OF ABSTRACT**	**18. NUMBER OF PAGES**	**19a. NAME OF RESPONSIBLE PERSON**
UU					Shridhar Yarlagadda
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MONTHLY REPORT

MAY 2013

MODELING AND SIMULATION OF CERAMIC ARRAYS TO IMPROVE BALLAISTIC PERFORMANCE

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Monthly Report for May 2013

ABSTRACT

- 2D AutoDyn analyses of cylinder impact on ceramic plate have been conducted to identify the mesh size needed to capture detail crack growth in ceramic tiles
- Steel 4340 is used for the projectile and AutoDyn SiC material properties are used for the ceramic tile
- Mesh sensitivity analysis is performed using four different square mesh sizes:
  - 0.50-mm x 0.50-mm square mesh
  - 0.40-mm x 0.40-mm square mesh
  - 0.30-mm x 0.30-mm square mesh
  - 0.20-mm x 0.20-mm square mesh
- Results shows that 0.20-mm mesh size provides a fracture pattern that may be considered acceptable for analysis
- A conico-cylinder projectile is also used to study the fracture behavior with 0.20-mm mesh size
- We will develop 3D FEMs for further AutoDyn analyses
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SUBJECT TERMS

- 2D AutoDyn modeling, cylinder impact, conico-cylinder impact, fracture pattern, mesh sensitivity

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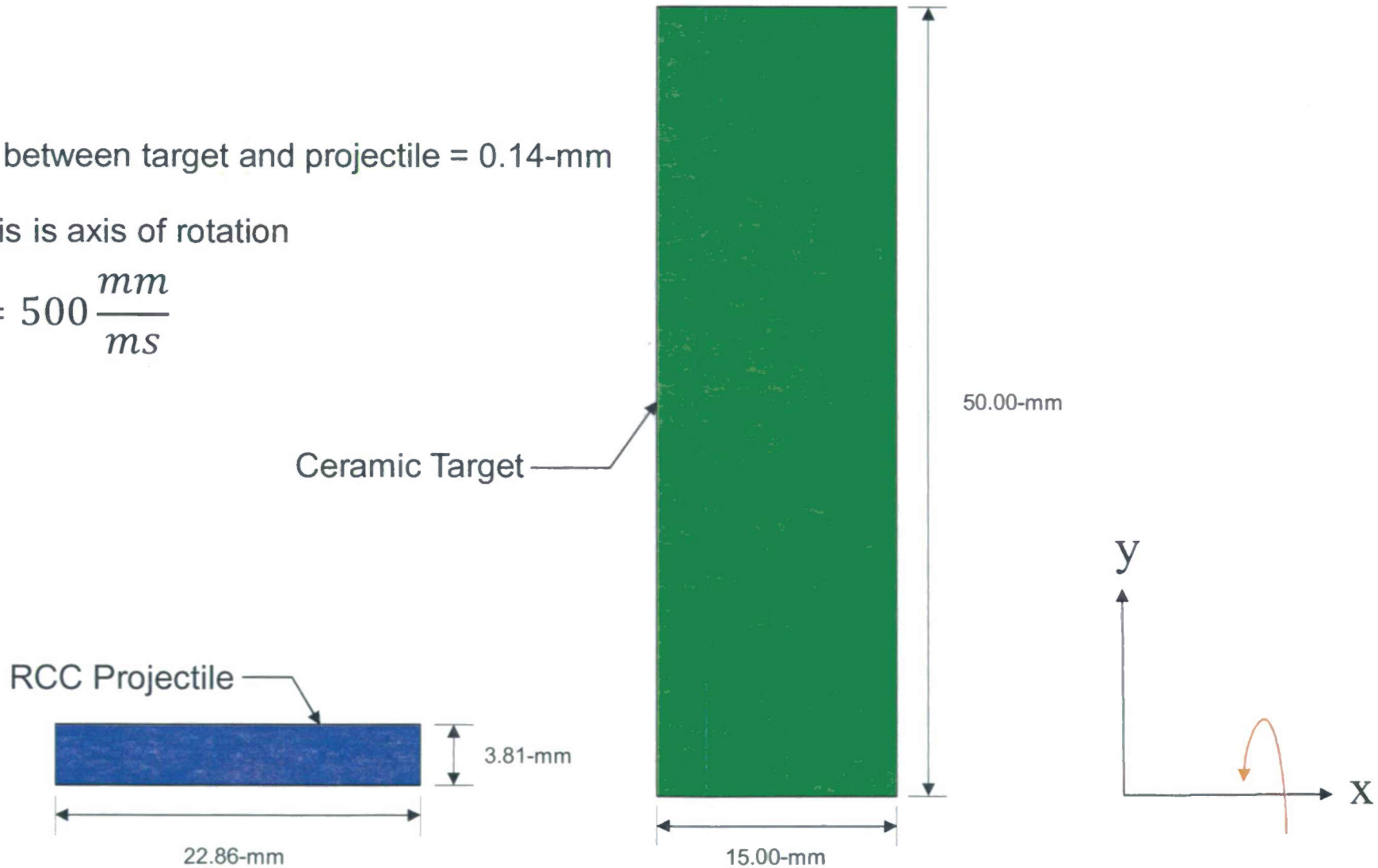
Axi-Symmetric Model Geometry

Gap between target and projectile = 0.14-mm

X-axis is axis of rotation

$$V_P = 500\frac{mm}{ms}$$



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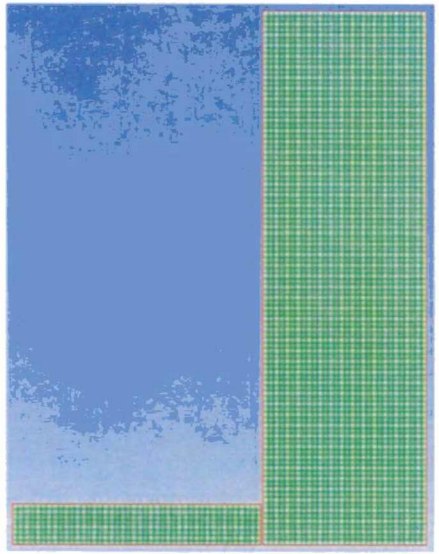
Different Mesh Sizes Investigated



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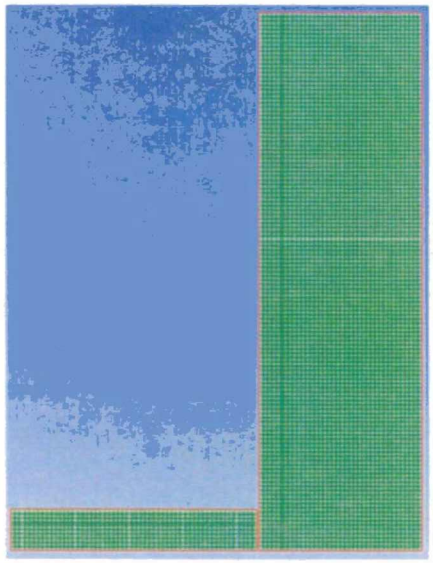

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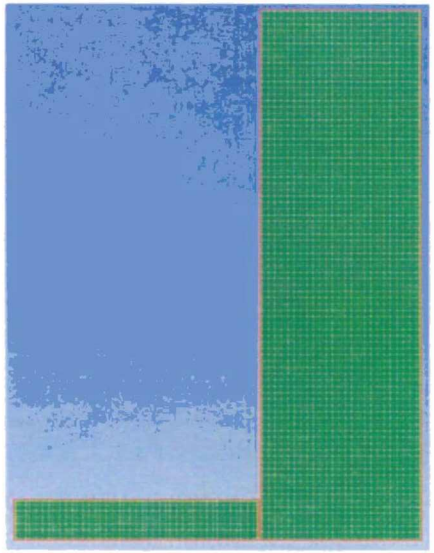

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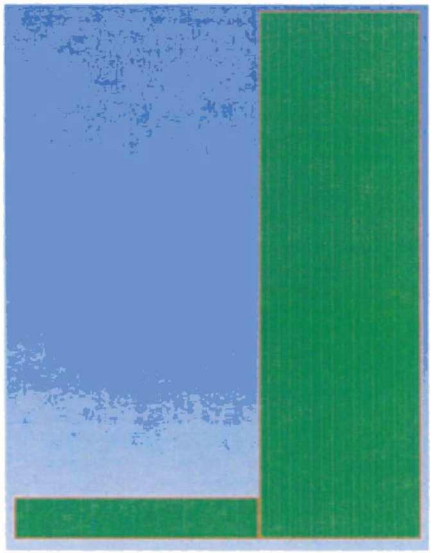

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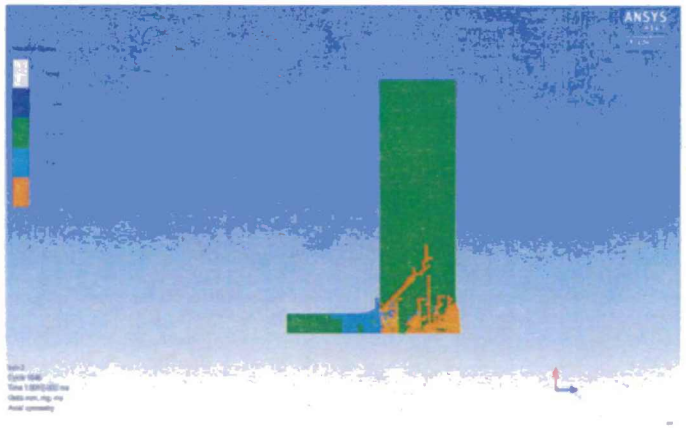
Fracture Pattern for 0.50-mm Mesh



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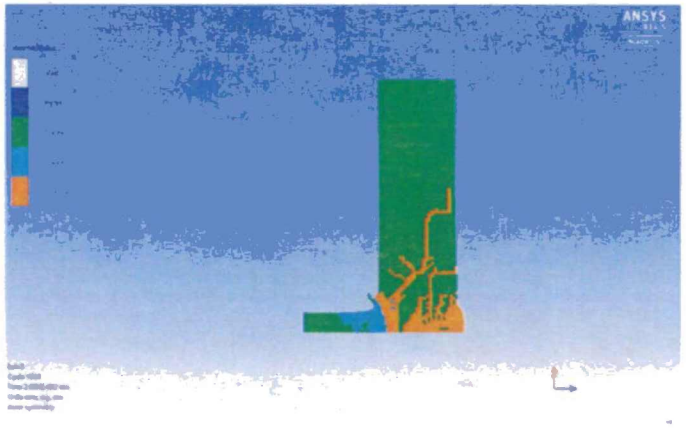

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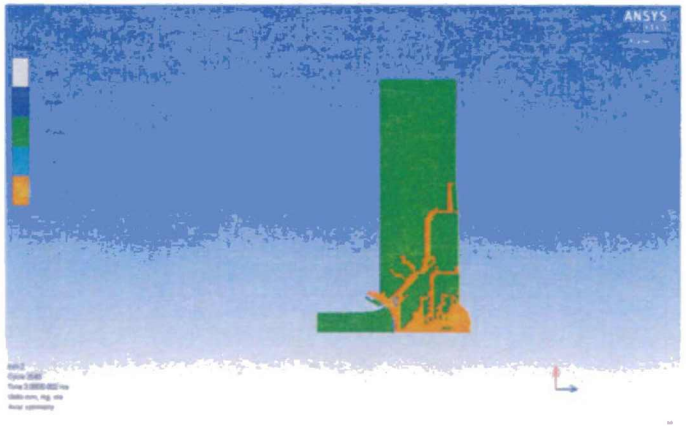

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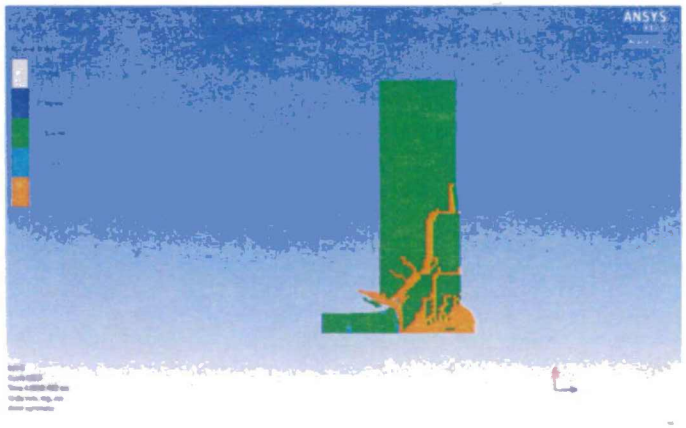

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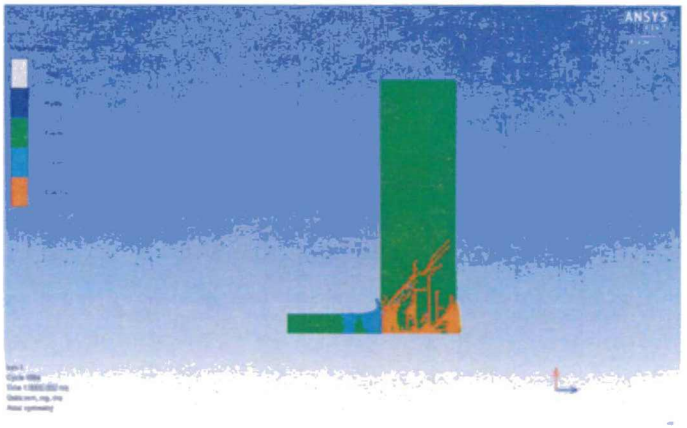
Fracture Pattern for 0.40-mm Mesh



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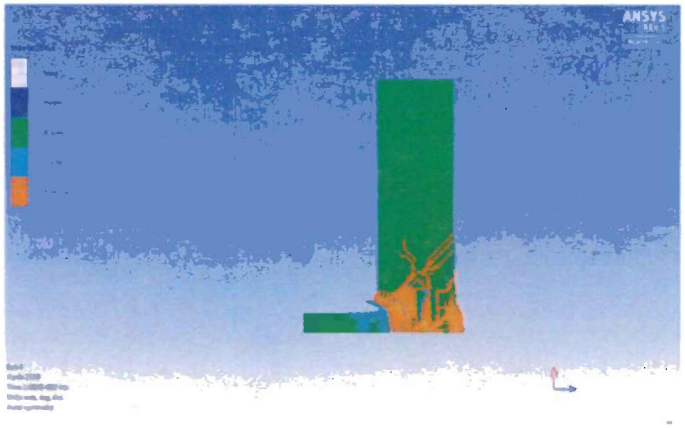

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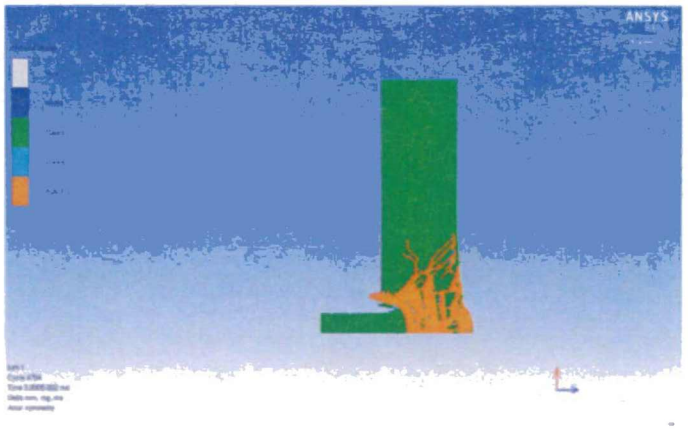

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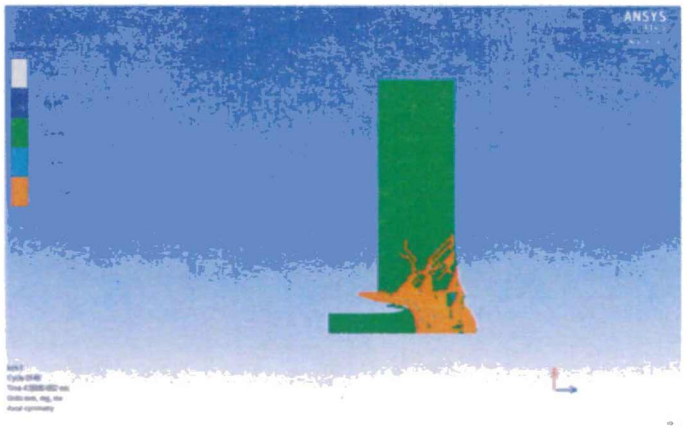

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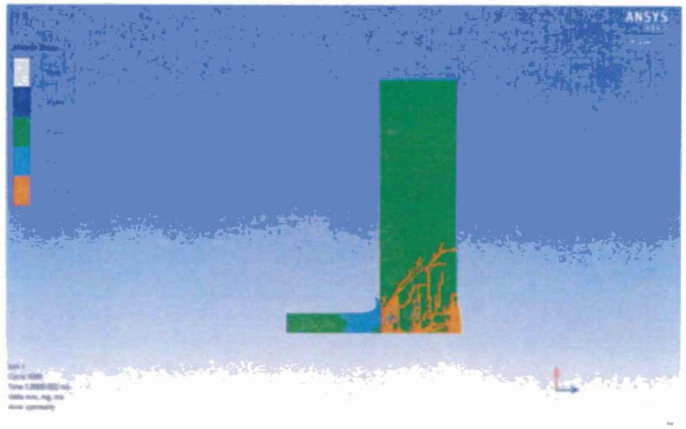
Fracture Pattern for 0.30-mm Mesh



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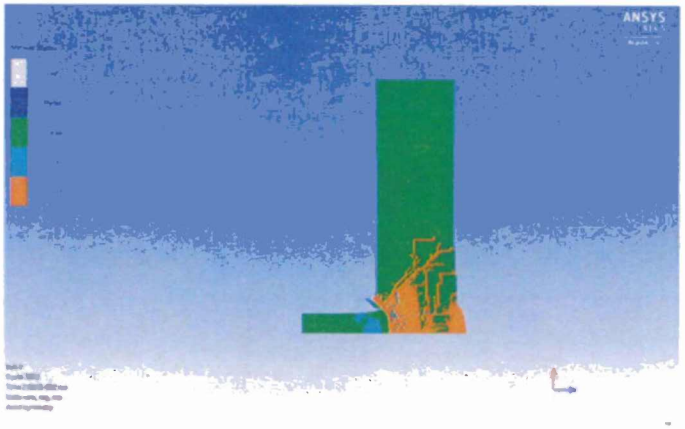

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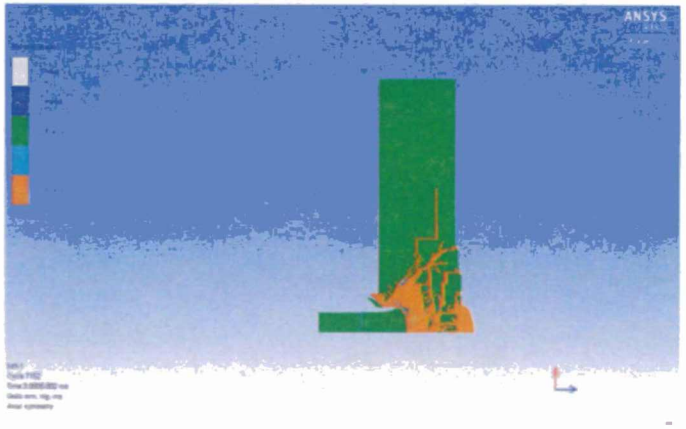

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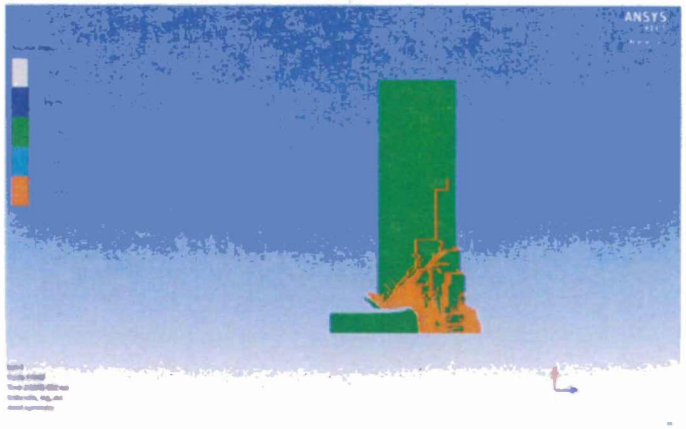

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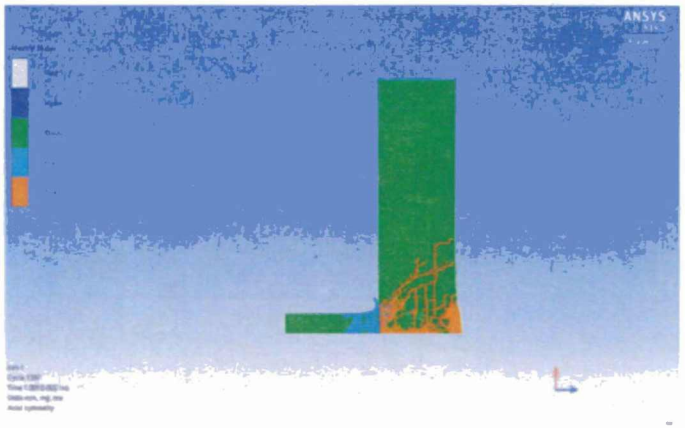
Fracture Pattern for 0.20-mm Mesh



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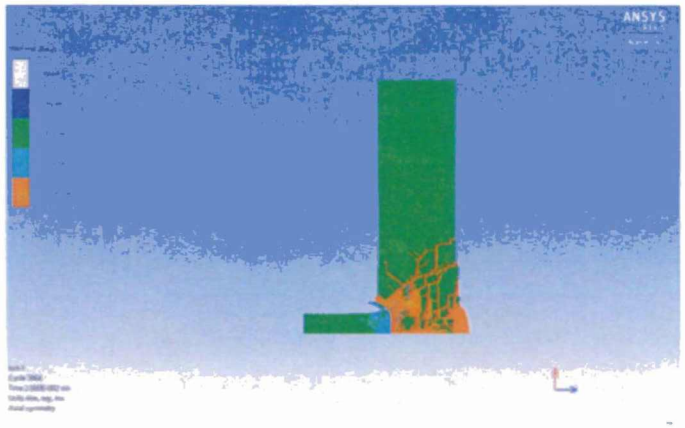

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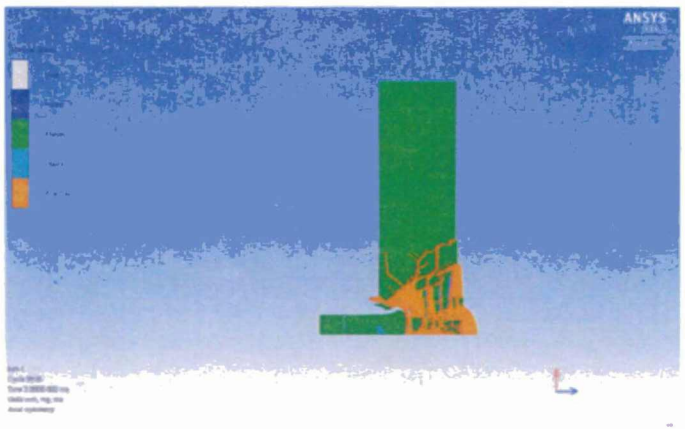

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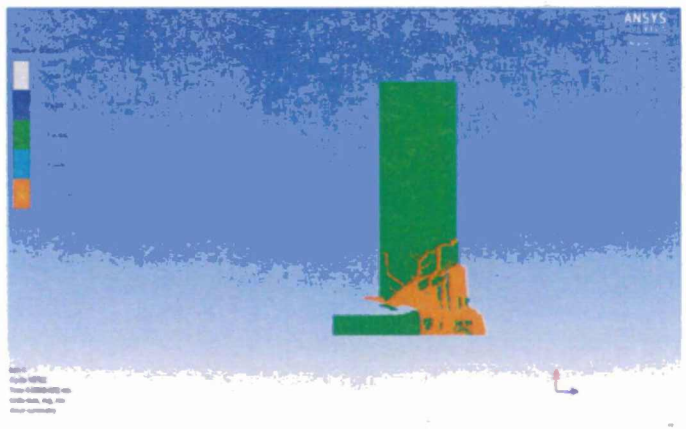

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Fracture Patterns for All Mesh Sizes
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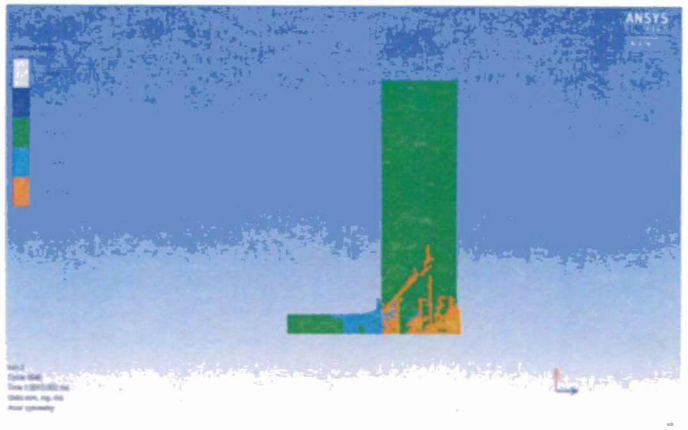

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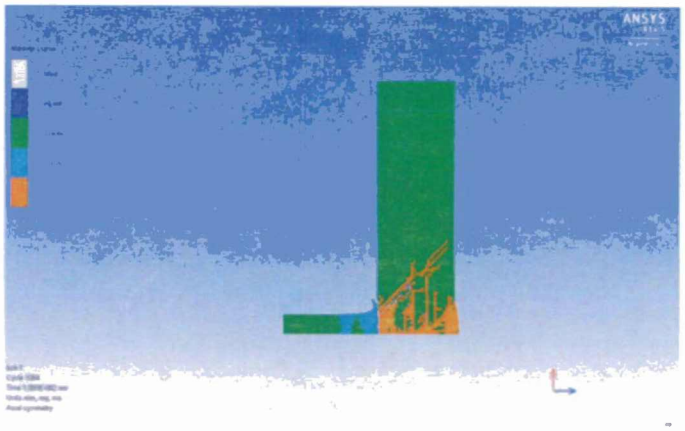

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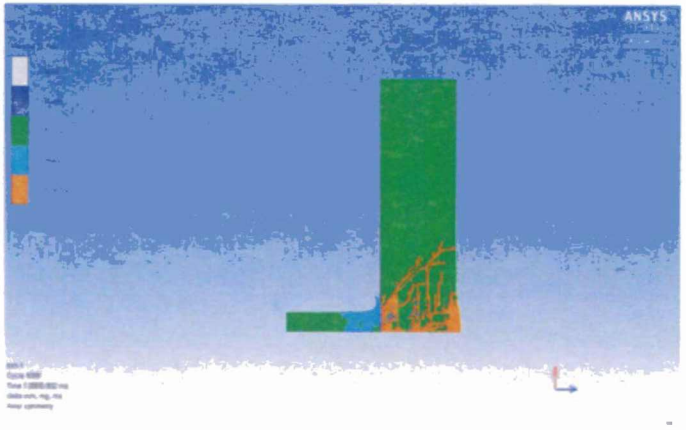

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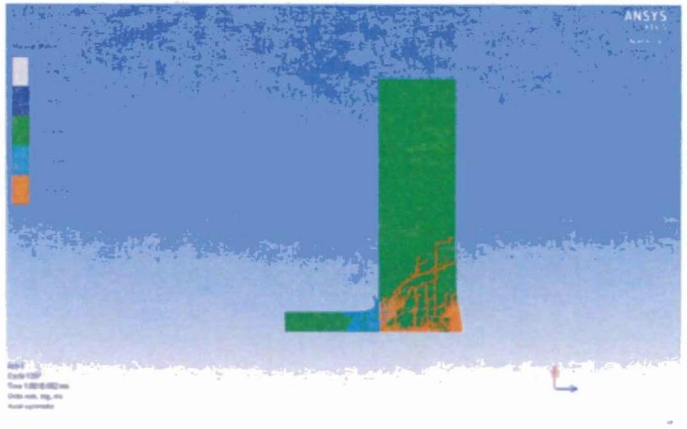

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Fracture Patterns for All Mesh Sizes
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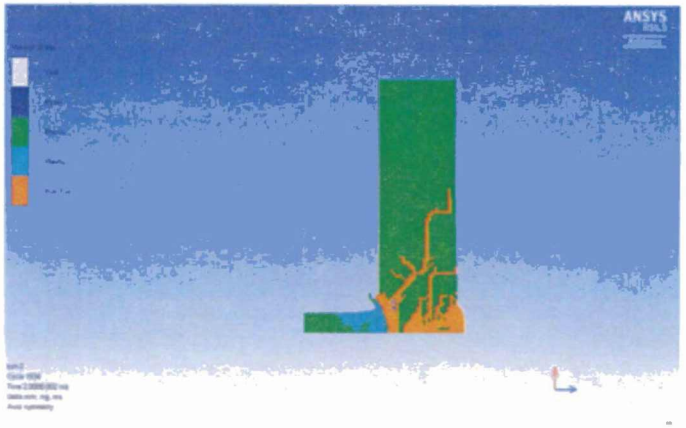

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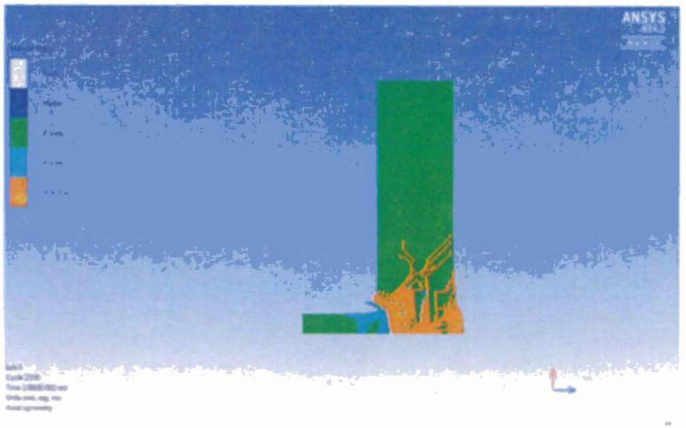

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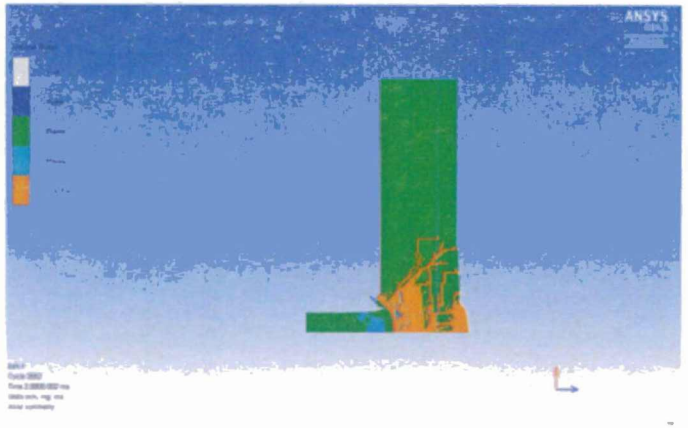

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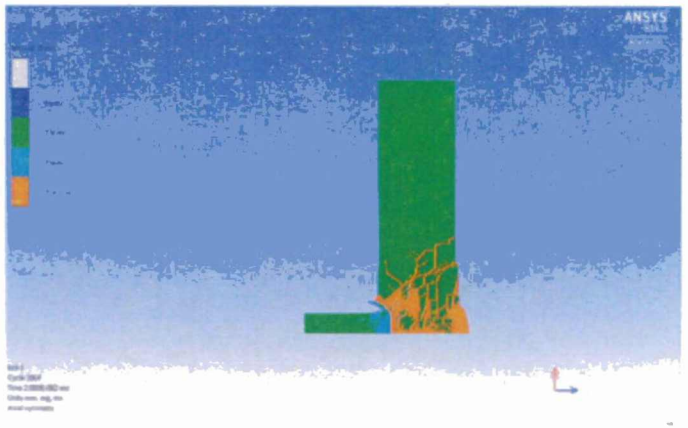

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Fracture Patterns for All Mesh Sizes
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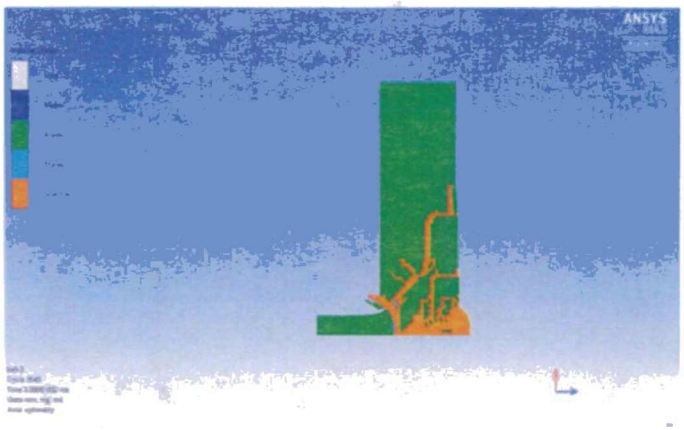

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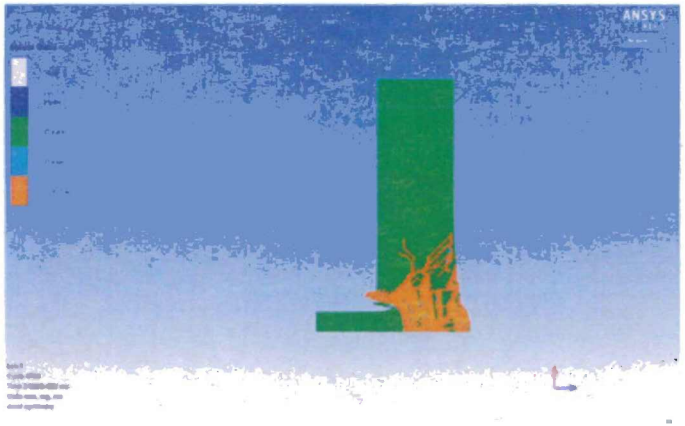

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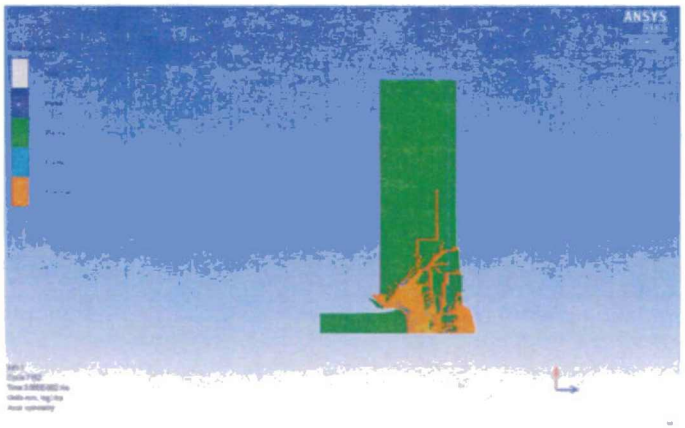

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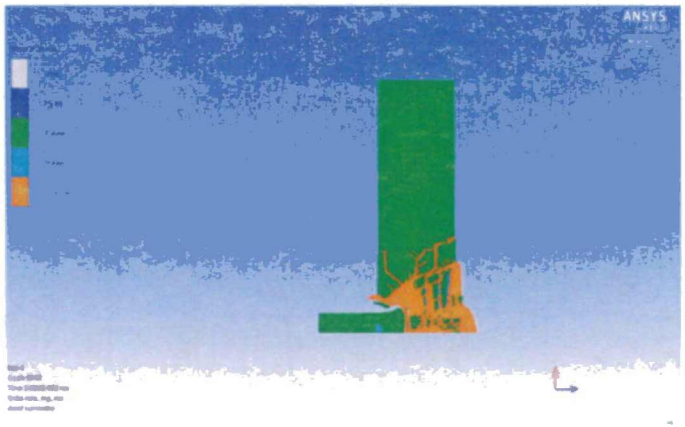

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Fracture Patterns for All Mesh Sizes
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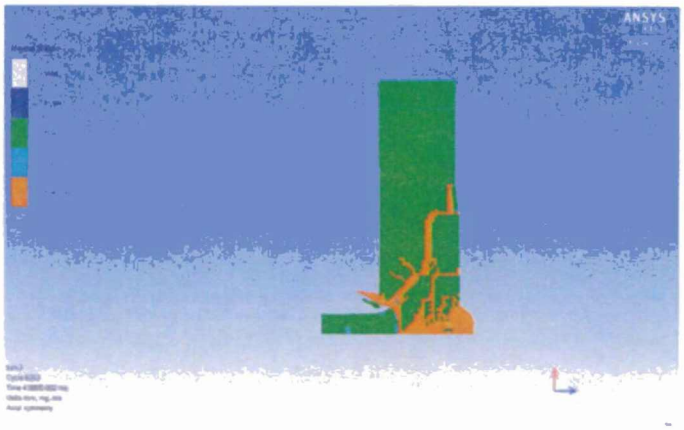

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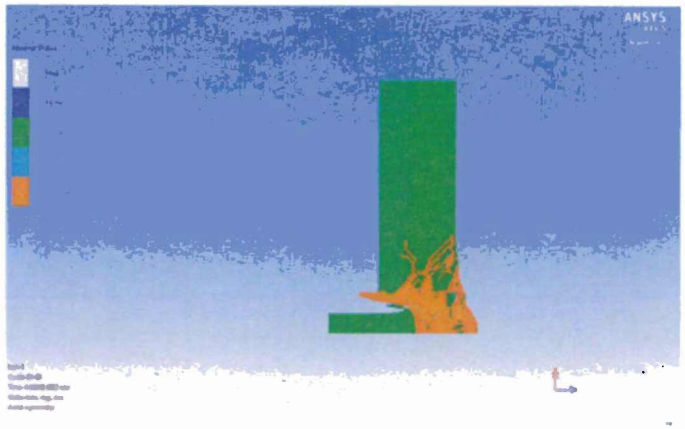

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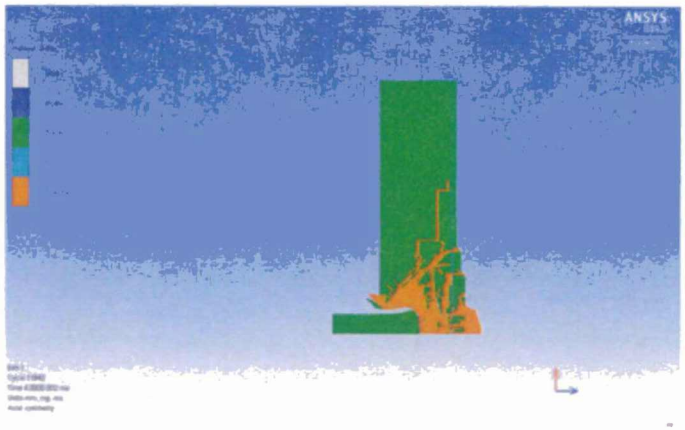

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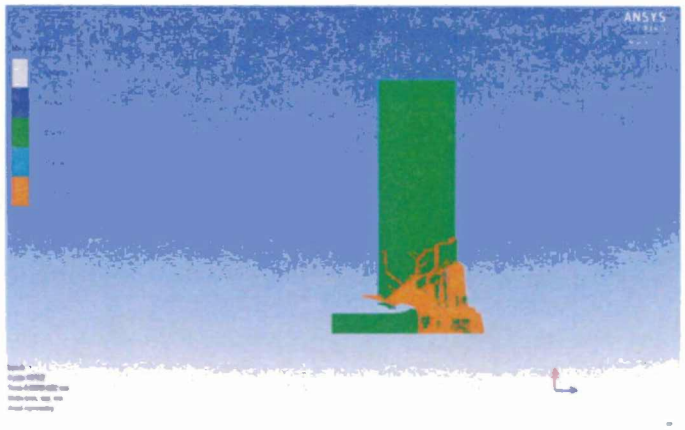

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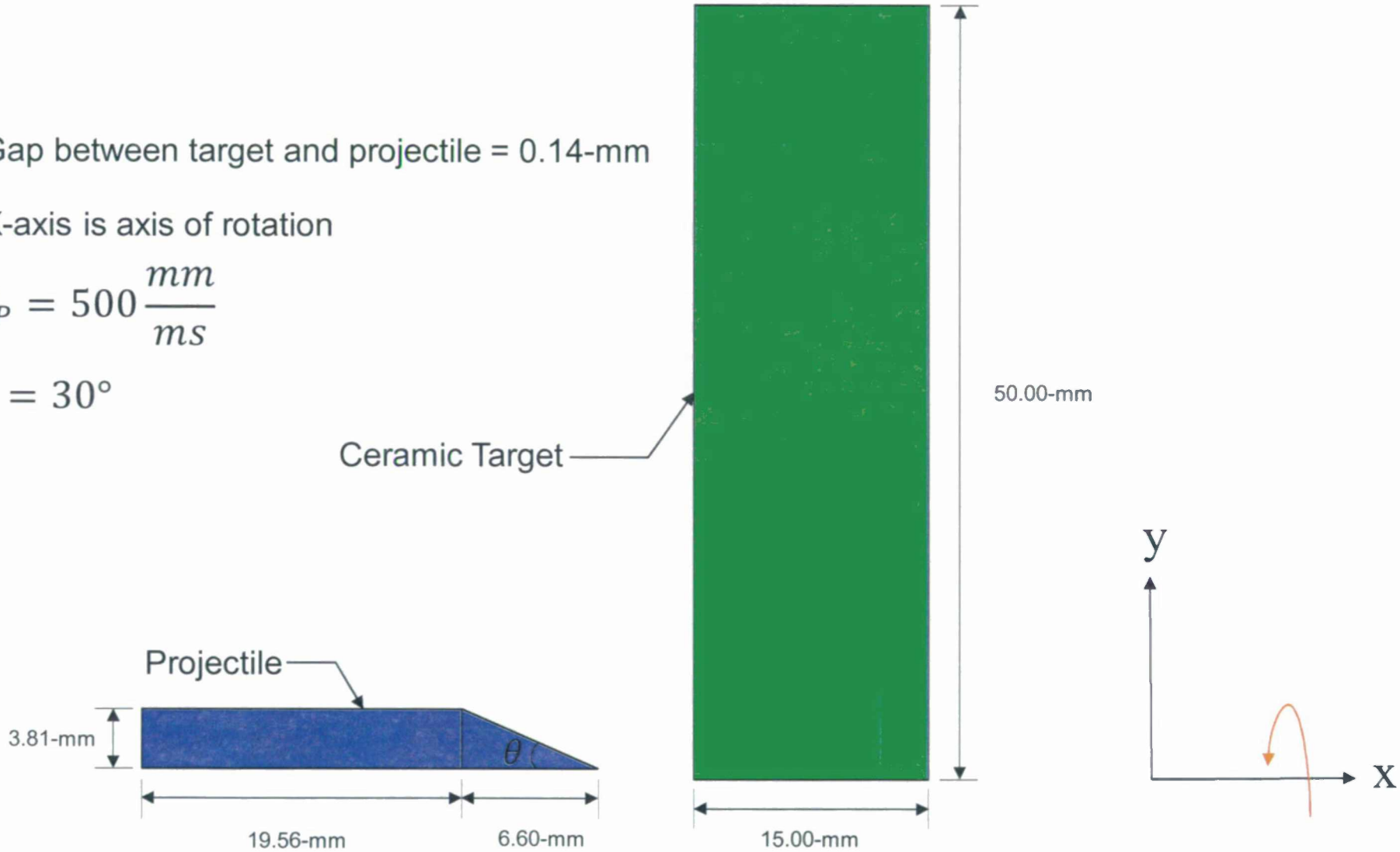
Axi-Symmetric Model Geometry

Gap between target and projectile = 0.14-mm

X-axis is axis of rotation

$$V_P = 500\frac{mm}{ms}$$

$$\theta = 30°$$



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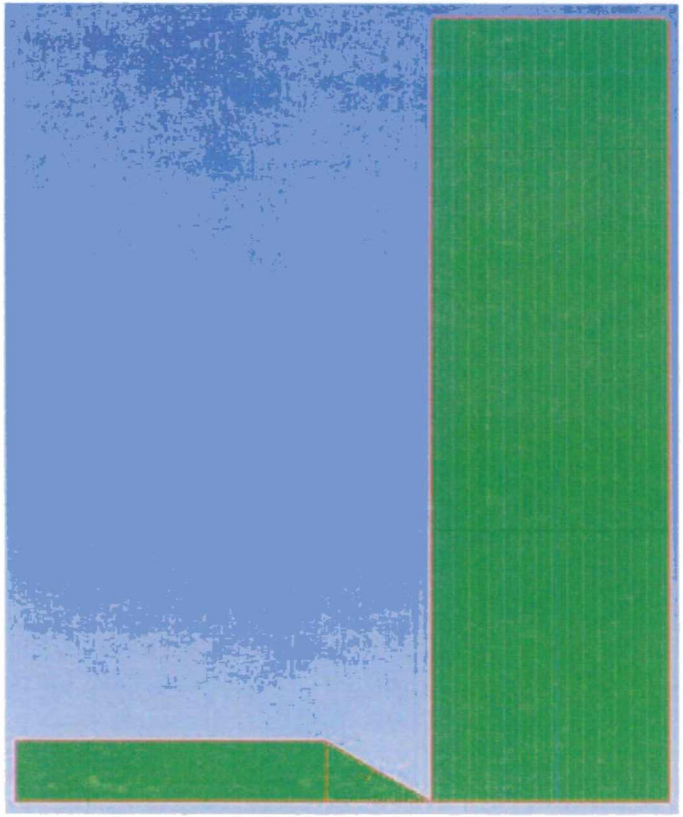
Mesh Size Investigated



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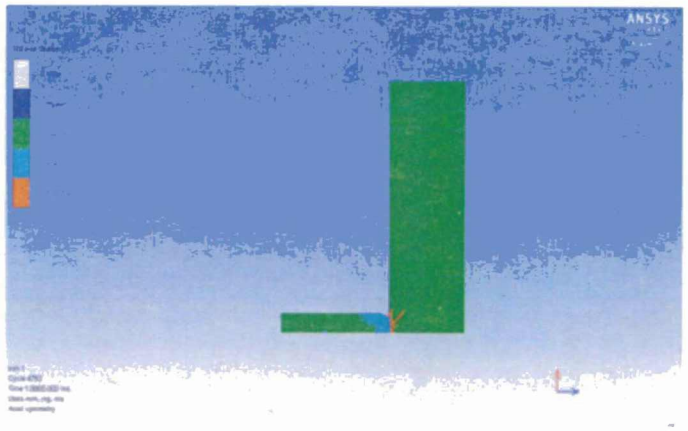
Fracture Pattern for 0.20-mm Mesh



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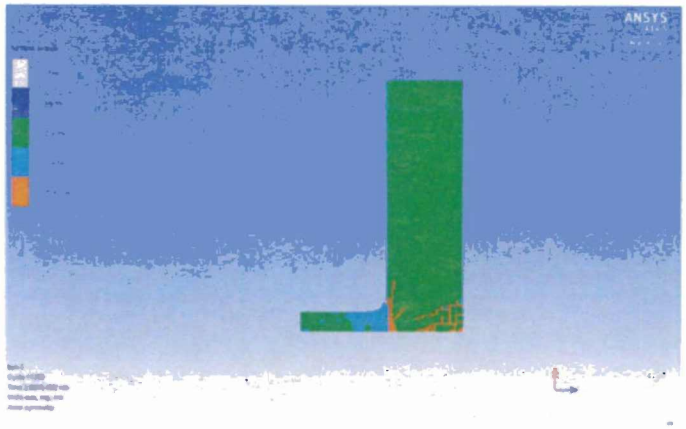

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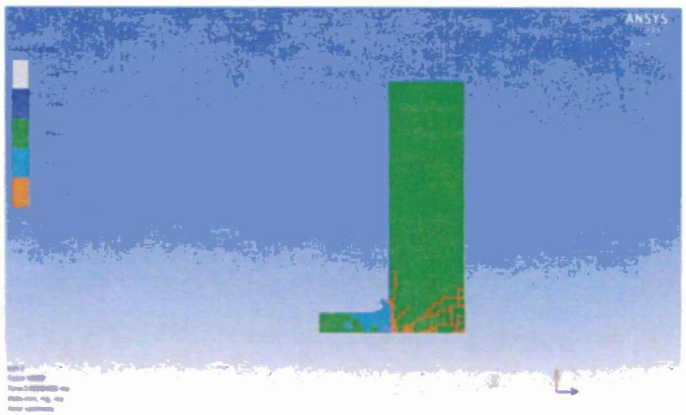

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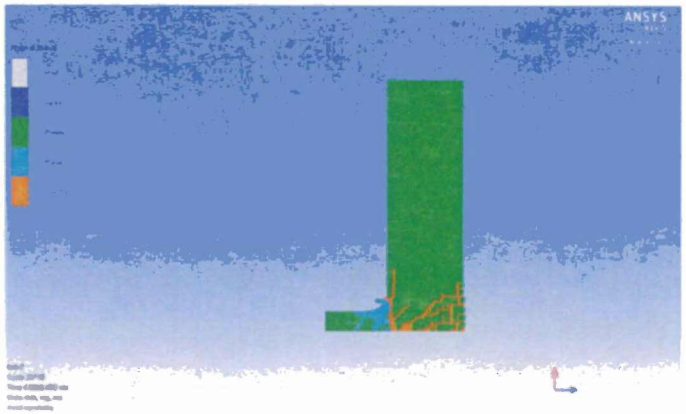

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